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(12) PATENT SPECIFICATION
ABRIDGEMENT
(19) AU

(21) 35,194/78 510,400 (22) 13.5.77
(23) 18.4.78 (24) 13.5.77
(43) 25.10.79 (44) 26.6.80
(51)[2] F16L 33/20

(54) Hose connector

(71) Frederick Duffield Pty Limited
(72) Duffield, F.R.
(74) GH

(56) 14,816/76 F16L
77,106/75 F16L
25,408/71 451,470 F16L

(57) Claim 1. An end fitting for a multi-spiral wire reinforced hose, the end fitting comprising a hollow stem portion and a ferrule arranged to surround the stem portion and to be swaged onto an end portion of the hose when located within an annulus between the stem portion and the ferrule, the stem portion and the ferrule including three axial zones wherein;

in the first zone the stem portion is provided with an annular channel-shaped neck portion in which a flange portion of the ferrule locates when the ferrule is swaged, to prevent axial separation of the ferrule and stem portion, and both the stem portion and ferrule are provided with at least one buttress, the respective buttresses being staggered and arranged within the annulus for engagement with and for deforming a projecting end portion of the hose reinforcement when the ferrule is swaged,

in the second (intermediate) zone the ferrule is provided with at least one band which projects into the annulus for engaging and deforming the hose reinforcement when the ferrule is swaged and the stem portion is provided with a surface engageable with an inner sheathing of the hose end when the ferrule is

.../2

swaged, and

in the third zone the ferrule is provided with a surface engageable with an outer sheathing of the hose end when the ferrule is swaged and the stem is provided with a surface engageable with the inner sheathing of the hose end.

FORM 1

REGULATION 9

10400

COMMONWEALTH OF AUSTRALIA

THE PATENTS ACT 1952-1973

APPLICATION FOR A PATENT

I/We FREDERICK DUFFIELD PTY. LIMITED

of 355, PACIFIC HIGHWAY, ARTARMON, NEW SOUTH WALES, AUSTRALIA 2064,

hereby apply for the grant of a Patent for an invention entitled: "VERY HIGH PRESSURE HOSE CONNECTOR"

which is described in the accompanying specification.

My/Our address for service is care of GRIFFITH, HASSEL & FRAZER, Patent Attorneys, of 323 Castlereagh Street, Sydney 2000, in the State of New South Wales, Commonwealth of Australia.

DATED this 17th day of April 1978.

By his/its Patent Attorneys:

GRIFFITH, HASSEL & FRAZER

TO:
THE COMMISSIONER OF PATENTS,
COMMONWEALTH OF AUSTRALIA.

APPLICATION ACCEPTED AND ALLOWED

18 APR 1978

Regulations 11(1)

COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

In support of the Application made by FREDERICK DUFFIELD PTY. LIMITED
(Name of Applicant Company)

for a patent for an invention entitled:

"VERY HIGH PRESSURE HOSE CONNECTOR"

I, Frederick Russell Duffield
(Full Name of Individual Declarant)
of the Applicant's address, do solemnly and sincerely declare as follows:

1. I am authorised by the applicant for the patent to make this Declaration on its behalf.

2. The Applicant is in possession of the invention, the subject of the application.

3. Frederick Russell Duffield
(Full Name of Inventor)
of 17, Baden Road, Kurraba Point, New South Wales 2089,
(Address)

is the actual inventor of the invention and the applicant is the assignee of the said inventor.

Declared at SYDNEY, AUSTRALIA this 19th
(City and Country)

day of May, 1977.

(Signature)
Managing Director

To:
The Commissioner of Patents
CANBERRA.

NOTE: Initial all Deletions and Alterations

GRIFFITH, HASSEL & FRAZER,
Box 2133, G.P.O.,
SYDNEY, AUSTRALIA.

COMMONWEALTH OF AUSTRALIA

Form 10

PATENTS ACT 1952-69

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE :

Class Int. Class

Application Number :

Lodged :

Complete Specification Lodged :

Accepted :

Published :

Priority :

Related Art :

TO BE COMPLETED BY APPLICANT

Name of Applicant : FREDERICK DUFFIELD PTY. LIMITED

Address of Applicant: 355, PACIFIC HIGHWAY, ARTARMON, NEW SOUTH WALES, AUSTRALIA, 2064.

Actual Inventor: FREDERICK RUSSELL DUFFIELD

Address for Service: Griffith, Hassel & Frazer, 323 Castlereagh St., SYDNEY N.S.W. 2000 AUSTRALIA

Complete Specification for the invention entitled:

"VERY HIGH PRESSURE HOSE CONNECTOR"

The following statement is a full description of this invention, with the best method of performing it known to ~~me~~/us:-

This invention relates to an end connector, hereinafter referred to as a hose end fitting, for high pressure hoses which are constructed with a number of plies of steel reinforcement wires located within the material of the hose.

The end fitting in accordance with the present invention is particularly suitable for use with hoses which are designed and constructed to withstand extra high pressures, for example pressures falling within the range 12 to 40,000 pounds per square inch. Such hoses have thick walls of a synthetic rubber material and contain steel wire reinforcement which is formed by four or six layers of parallel steel wires with alternate layers wound in opposite directions.

The present invention seeks to provide a hose end fitting which is capable of withstanding extremely high tensile and other loadings which are applied to such hoses and which at the same time provides for sealing against ingress of moisture which could corrode hose reinforcement which is located within the end fitting.

Thus, the present invention provides an end fitting for a multi-spiral wire reinforced hose, the end fitting comprising a hollow stem portion and a ferrule arranged to surround the stem portion and to be swaged onto an end portion of the hose when located within an annulus between the stem portion and the ferrule, the stem portion and the ferrule including three axial zones wherein;

in the first zone the stem portion is provided with an annular channel-shaped neck portion in which a flange portion of the ferrule locates when the ferrule is swaged, to prevent

axial separation of the ferrule and stem portion, and both the stem portion and ferrule are provided with at least one buttress, the respective buttresses being staggered and arranged within the annulus for engagement with and for deforming a projecting end portion of the hose reinforcement when the ferrule is swaged,

in the second (intermediate) zone the ferrule is provided with at least one band which projects into the annulus for engaging and deforming the hose reinforcement when the ferrule is swaged and the stem portion is provided with a surface engageable with an inner sheathing of the hose end when the ferrule is swaged, and

in the third zone the ferrule is provided with a surface engageable with an outer sheathing of the hose end when the ferrule is swaged and the stem is provided with a surface engageable with the inner sheathing of the hose end.

The invention will be more fully understood from the following description of a preferred embodiment thereof, the description being given with reference to the accompanying drawings wherein:

Figure 1 shows a half-sectioned elevation view of a hose end fitting, the hose being omitted for the purpose of showing the interrelationship of the stem portion and the sleeve or ferrule portion of the end fitting,

Figure 2 shows a view similar to Figure 1 but with a hose end located between the fitting portions prior to a swaging operation,

Figure 3 illustrates one-half of the end fitting shown in Figure 2, but after swaging the ferrule portion onto the stem portion, with the hose end clamped between the two fitting portions,

Figures 4a and 4b are scrap views which respectively show the interfitting relationship of the lefthand end part of the stem and ferrule portions prior to and after a swaging operation,

Figures 5a and 5b are scrap views which show a larger part of the lefthand end of the stem and ferrule portions, together with hose reinforcement wires, prior to and after the swaging operation,

Figure 6 is a scrap view of an intermediate part of the stem and ferrule portions after a swaging operation,

Figure 7 shows an enlarged view of a portion of the ferrule after a swaging operation, and

Figure 8 shows a scrap view of a righthand end part of the stem and ferrule portions after a swaging operation.

The end fitting as shown in the drawings comprises two portions, a hollow stem portion 10 and a sleeve or ferrule portion 11 which is hereinafter referred to as a ferrule. The stem portion 10 is intended to be located in part within the bore 12 of a hose 13, and, as shown, the stem portion includes a male coupling portion 14 at its lefthand end. However, the coupling portion 14 could equally be formed as a female coupling portion.

Both the end fitting and the hose end may be regarded as including three axial zones which are referenced by

numerals 15, 16 and 17 in Figure 1. The first axial zone 15 of the end fitting acts to clamp a projecting end of metal reinforcement 18 of the hose 13. Also, within the first axial zone 15 of the end fitting, an interference connection is made between the stem and the ferrule portion during a swaging operation. This is described later in the specification.

The second (intermediate) axial zone 16 of the end fitting acts to clamp both the hose reinforcement 18 and an inner sheath portion 19 of the hose end.

The third axial zone 17 of the end fitting acts to clamp the entire end portion of the hose, including the reinforcement 18, inner sheath 19 and an outer sheath 20 of the hose.

Thus, before mounting the end fitting to the hose 13, the hose is prepared by stripping the inner sheath 19 from the reinforcement 18 for the axial distance 15, and the outer sheath 20 is stripped from the reinforcement for the axial distance 14 plus 16.

To the right of the coupling portion 15 of the stem portion is a neck 21 which is constituted by an annular channel and which is flanked by an annular flange 22 of square cross-section. Spaced in an axial direction from the flange 22 are two annular buttresses 23 of trapezoidal cross-section, and spaced further to the right are four axially spaced sets of annular sealing ribs 24. Each sealing rib 24 is semi-circular in cross-section.

Annular troughs or channels 25 separate the first buttress 23 from the flange 22 and separate the two buttresses 23.

The ferrule 11 is arranged to locate about the stem portion 10 and to define an annulus which receives the hose end 13. The ferrule is machined so as to fit over the hose end, when stripped as shown in Figure 2, and, after fitting the various portions together, the ferrule is swaged radially inwardly, using encircling swaging dies to compress the ferrule onto the hose end portion 13. This has the effect of clamping the hose between the ferrule and the stem portion 10, as shown in Figure 3 and as below described.

The ferrule 11 includes a radially inwardly directed flange 26 at its lefthand end which aligns with the neck 21 and which locates within the neck during the swaging operation. This is most clearly shown in Figures 4a and 4b.

Referring to Figures 4a and 4b, the bore defined by the flange 26 is sized to provide a radial clearance d with respect to the major diameter of the stem portion 10 and, when the ferrule is swaged, the flange 26 is displaced inwardly (together with the remaining portion of the ferrule) by radial distance D to locate within the neck 21. With this interference between the flange 26 and the neck 21, as shown in Figure 4b, axial separation of the stem and ferrule portions 10 and 11 is prevented.

The interior of the ferrule is provided with two axially spaced buttresses 27 which are arranged in staggered formation with respect to the stem buttresses 23. Separating the buttresses 27 and aligned with the buttresses 23 are two annular recesses 28.

As best shown in Figures 5a and 5b, the buttresses 23 and 27, troughs 25 and the recesses 28 co-operate with each other to deform the projecting end of the hose reinforcement 18 such that it assumes a serpentine or corrugated path during the swaging of the stem and ferrule portions.

Also within the ferrule and spaced axially to the right of the buttresses 27 are three annular-form bands 29. The three bands 29 are aligned radially with respective sets of the ribs 24.

When the ferrule is swaged onto the hose end and the stem portion, the bands 29 serve the dual function of deforming the hose reinforcement 18 and of compressing the inner sheath 19 of the hose onto the stem portion 10. With the inner sheath 19 compressed against the stem portion, as is best seen from Figure 6, the ribs 24 serve to seal against penetration of high pressure fluid from the hose bore.

Also, during the swaging operation, which must be performed by application of extremely high forces, individual strands of the hose reinforcement 18 cause deformation of the surfaces of the buttresses 23 and 27 and of the bands 29 such that the strands embed and lock within the buttresses and bands. This condition is shown in Figure 7.

After the righthand end band 29, the ferrule 11 opens into a recess 30 which receives the outer sheath 20 of the hose, as shown in Figures 2, 3 and 8. The recess 30 is terminated by an inwardly directly nib 31 which functions,

when the ferrule is swaged onto the hose, to seal the outer sheath of the hose and to prevent moisture from migrating into the body of the fitting where it could corrode the hose reinforcement.

When the end fitting is to be attached to the hose 13, the hose end portion is prepared by paring the inner and outer sheaths from the reinforcement as described above, and the hose end is pushed into the ferrule 11. Thereafter the stem is forced into the bore of the hose end and a swaging force is applied to the periphery of the ferrule 11. The dies of the swaging press, not shown, encircle the ferrule and bear on the salient portions on the periphery of the ferrule, such salient portions lying opposite the positions of the buttresses 27 and bands 29.

As a result of application of the swaging force, the ferrule is compressed onto the hose end portion and the reinforcement is distorted such that it follows the serpentine pattern shown in the drawings and above described.

As a result of the swaging operation, four separate but interrelated clamping functions are performed. The ferrule is clamped into an interference fit with the stem portion, by way of flange 26 locking in neck 21, the hose reinforcement 18 is clamped between the stem and the ferrule over axial zones 15 and 16, the inner sheath 19 of the hose is clamped and sealed to the stem portion over axial zones 16 and 17, and the outer sheath 20 of the hose is clamped and moisture-sealed to the ferrule over axial zone 17. With this arrangement, any tensile loading which is applied to the hose 13 is

transmitted to both the stem portion and the ferrule which are themselves positively interconnected by the neck and flange portions 22 and 26 as well as by way of the deformed hose reinforcement.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An end fitting for a multi-spiral wire reinforced hose, the end fitting comprising a hollow stem portion and a ferrule arranged to surround the stem portion and to be swaged onto an end portion of the hose when located within an annulus between the stem portion and the ferrule, the stem portion and the ferrule including three axial zones wherein;

in the first zone the stem portion is provided with an annular channel-shaped neck portion in which a flange portion of the ferrule locates when the ferrule is swaged, to prevent axial separation of the ferrule and stem portion, and both the stem portion and ferrule are provided with at least one buttress, the respective buttresses being staggered and arranged within the annulus for engagement with and for deforming a projecting end portion of the hose reinforcement when the ferrule is swaged,

in the second (intermediate) zone the ferrule is provided with at least one band which projects into the annulus for engaging and deforming the hose reinforcement when the ferrule is swaged and the stem portion is provided with a surface engageable with an inner sheathing of the hose end when the ferrule is swaged, and

in the third zone the ferrule is provided with a surface engageable with an outer sheathing of the hose end when the ferrule is swaged and the stem is provided with a surface engageable with the inner sheathing of the hose end.

2. An end fitting as claimed in claim 1 wherein, in the first zone, the stem portion is provided with two annular said buttresses, the buttresses being staggered in an axial direction with respect to the buttress(es) in the ferrule and being disposed so as to induce a serpentine path in the hose reinforement when clamped within the annulus.

3. An end fitting as claimed in claim 1 or claim 2 wherein, in the second zone, the ferrule portion is provided with three annular said bands.

4. An end fitting as claimed in any one of claims 1 to 3, wherein, in the second zone, the ferrule is provided with a further said buttress.

5. An end fitting as claimed in any one of claims 1 to 4, wherein, in the second zone, the surface of the stem portion is provided with annular ribs which project into the annulus.

6. An end fitting as claimed in claim 5, wherein there is a plurality of the ribs located opposite the or each of the bands.

7. An end fitting as claimed in any one of claims 1 to 6, wherein, in the third zone, the ferrule is provided adjacent its terminal end with a rib which is shaped to penetrate the surface of the outer sheath of the hose when the ferrule is swaged.

8. An end fitting substantially as shown in the accompanying drawings and substantially as hereinbefore described with reference thereto.

~~9. A method of mounting an end fitting as claimed in any one of the preceding claims to a hose, the method being~~

~~substantially as hereinbefore described with reference to the accompanying drawings.~~

DATED this 17th day of April 1978

FREDERICK DUFFIELD PTY. LIMITED
By their Patent Attorney:

of GRIFFITH, HASSEL & FRAZER

FIG. 1

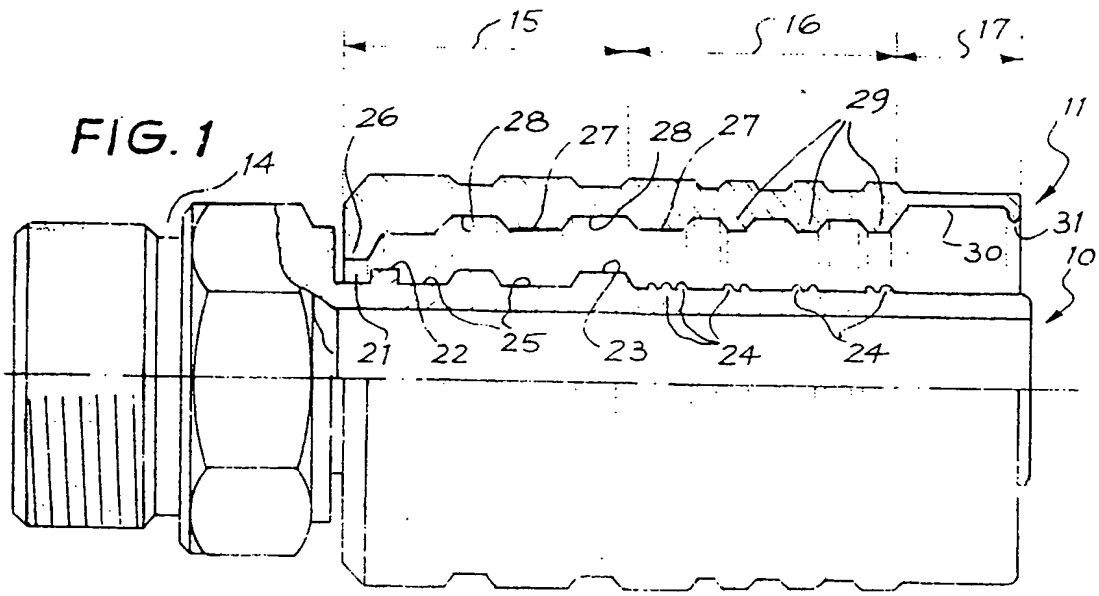


FIG. 2

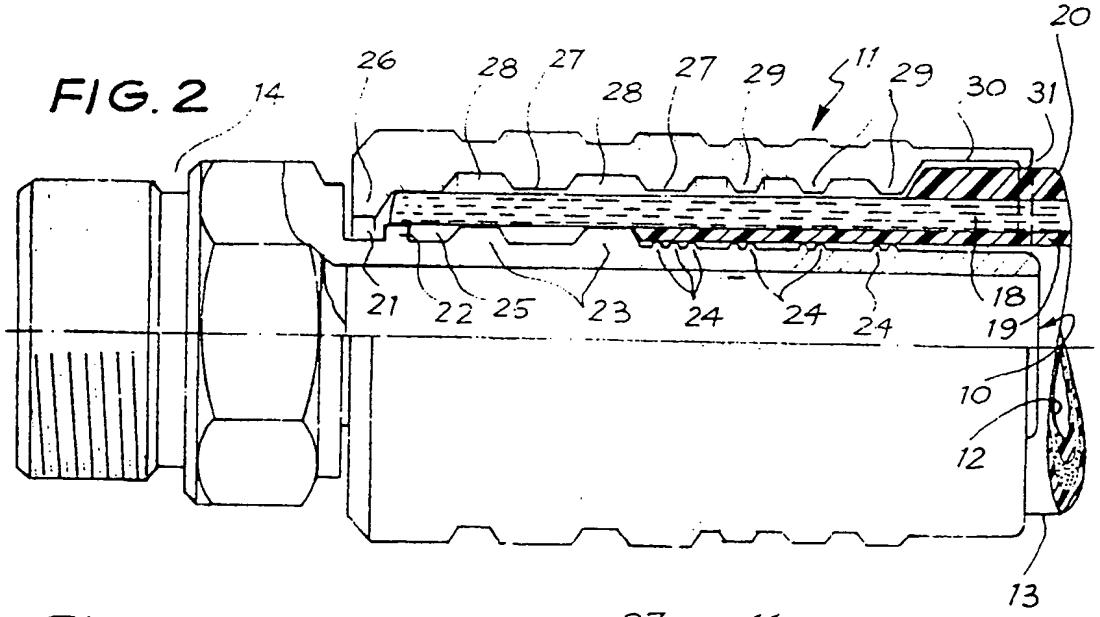


FIG. 3

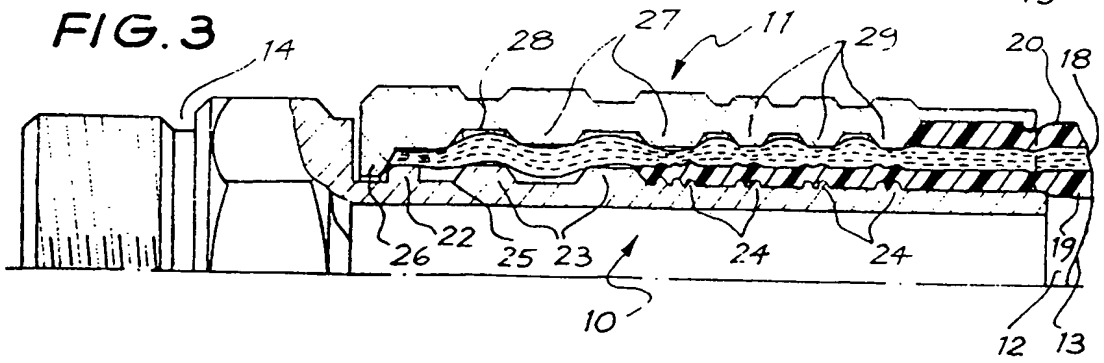


FIG. 4A

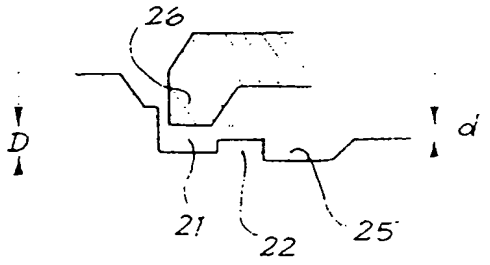


FIG. 4B

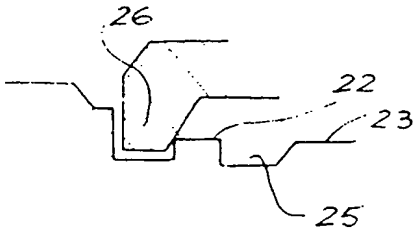


FIG. 5A

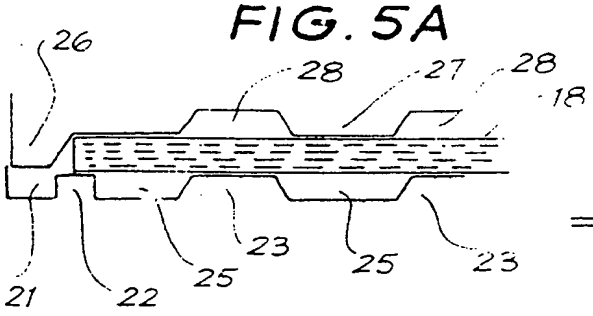


FIG. 5B

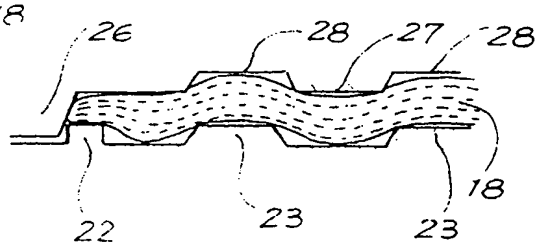
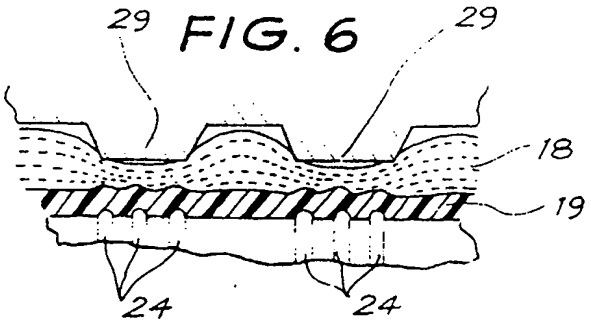


FIG. 6



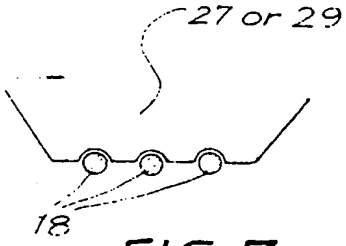
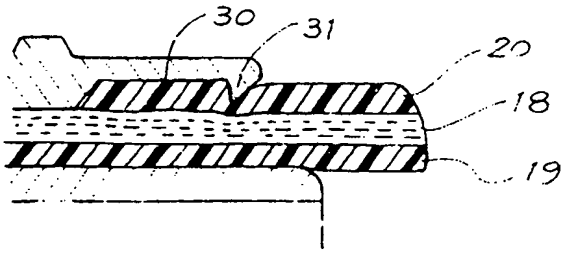


FIG. 7

FIG. 8



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